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PLANT GENETICS AND BREEDING OF AGRICULTURAL PLANTS

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PLANT GENETICS AND BREEDING OF AGRICULTURAL PLANTS

No.891

C.4.1.

by

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1. The use of selected seeds of plant varieties and crosses, cultivated on large acreages, is especially important in the process of consistently increasing agricultural production. As a rule, the use of selected seeds gives a surplus of yield of 15 to 20 per cent, and that of crosses 20 to 40 per cent. We therefore consider as highly justified, the attention granted by our Conference to the problem of producing selected seeds and giving them over to farming, this being one of the most important problems in connection with the rising of agricultural production in underdeveloped countries. The exchange of experience between specialists may undoubtedly be useful in as much as it can offer suggestions able to stimulate the activity in this field, thereby taking into account the special conditions pervading in each country. In our report we intend to present some of our studies and of the results obtained in the Rumanian People 's Republic.

2. a) The first attempts to create new agricultural plant varieties and crosses date back to 1929, the year of the foundation of the Institute for agricultural research of Rumania. In the first stage, the method of studying local populations and singling out from them plants, the progenies of which were multiplied and selected individually was widely used and, to a lesser extent, the sexual crossing between different plant varieties and subspecies.

b) It was in this way that the first local grain varieties were obtained such as : the winter wheat varieties A 15, resistant to frost and drought and Cenad 117 with mediocre resistance to drought and frost, grown in the hilly regions of the country; the winter barley variety Cenad 396, very productive, resistant to drought and winter frost down to - 13 °C, cultivated more in regions with rather mild winters; the oats varieties Cenad 88, very productive, better adapted to regions with more abundant rainfalls and Gg.Frumos 9, with higher drought resistance, grown in the more arrid steppe.

i) The winter barley variety Cenad 396 grows well even when sown very early in spring after a wintercrop distroyed by frost. In such a case its yield approaches that of the selected two rowed spring barley varieties.

ii) The above mentioned cereals have been more often grown in the conditions of extensive agriculture, typical for prewar Rumania. In the conditions created by the practice of modern techniques in Rumania's new socialist agriculture, these varieties show a sensibility to lodging and to rust, yielding 15 - 30 % less than the new highly productive varieties, resistant to lodging and to rust.

c) The method of singling out lineages from local populations has also been used, at the beginning, in the breeding of leguminous, crops, forage plants and vegetables.

i) Thus, the following varieties of beans have been originated: ICA 52/54, ICA 416, ICA 332 and Fasolea de Banat, all of them highly productive, with 7 to 10 days earlier than the local varieties; further on native varieties of clover and esparcet, well adapted to the local climate and soil conditions; vegetables varieties; tomatoes Aurora 100 and Tigăneşti 157, pimentos Bucureşti 111 and Romînesc, water melon Lovrin 532 and white cabbage Licurişca de Tigănesti.

ii) The two tomato varieties are characterized by their great resistance to diseases and drought, and by high yields. The pimento varieties are moderately resistant to viroses, have a vigorous growth and are very productive. The water melon variety has also a vigorous growth, is resistant to drought, yields ovoidal fruits weighing from 5 to 8 kg., resistant to transport, with a bright red, juicy and sweet pulp. The cabbage variety is very productive, with heads weighing between 2 and 4 kg., excellent for sauerkraut and winter storage. All the above mentioned varieties of vegetables yield 15 - 30 % more than those ganerally grown in the respective regions.

3. From 1948 on, the method of breeding by guided crossing between subspecies and varieties, followed by the training of crosses under best fertility conditions and by individual selection, was extended and applied to almost all agricultural crops. There has also been largely made use of crossing between subspecies and varieties, remote from one another from the geographical point of view, especially of soviet, polish, italian, belgian and american origin. By singling out and multiplying " élite " plants from the first hybrid generations, most of the promising varieties of the most important agricultural crops could be obtained lately.

4. The methods referred to in the preceding paragraph, allowed to originate the most recent and promising varieties and lineages of cereal and leguminous crops. Among them are: the winter wheat varieties: Cluj 11/54 and Cluj 918, both resistant to diseases and lodging, very productive, with high grain and panification qualities, grown in regions whith rich rainfalls; the winter wheats ICA 495, ICA 457 B and ICA 440 C, all of them resistant to lodging, frost and drought, very productive, with high grain and panification qualities; the summer wheat varieties Măgurele 7 and Cîmpia Turzii 1 moderately precocious, resistant to diseases and lodging, well adapted to regions with more abundant rainfalls; the two-rowed summer barley varieties Magurele 287 and Măgurele 342, precocious and rather resistant to lodging, very productive, grown in regions with more abundant rainfalls; the summer oats variety Cenad 309, very productive, sufficiently precocious and very resistant to lodging; the pea variety ICA 53/54, by 5 - 7 days earlier then the local varieties, very productive and of good quality.

5. The method of sexual crossing has likewise been successfully applied to oil, fibre, root and tuber crops. The most important varieties originated are: the dioecious hemp ICA 42/118, the fibre flax ICA 6/49, the oil flax Deta and ICA 32/53, the potatoes Bucureşti 99/53 and Măgurele 694/54, the sugarbeets Lovrin 532, Cîmpia Turzii 34 and Bod 165, the esparcet ICA 6 and Bărăgan 2, etc.

6. The cereal varieties originated during the last years are better suited to intensive agricultural methods, more resistant to lodging, to cryptogamic diseases and to shedding. They also yield 10 - 20 % more, on large acreages.

7. All the new lineages of leguminous, fibre, oleaginous, root and tuber crops, as well as of fodder plants, give high yields and are qualitatively superior to those of the whole range of varieties used in the past in our country. Thus, the new lineages of beans and peas are earlier and more resistant to diseases, the fibre flax lineages are by 2 - 5 % richer in fibres, the oil flax varieties are more resistant to lodging and richer in oil, the potato lineages are more resistant to viroses and mildew, the beet lineages are more resistant to drought and to Cercospora and better adapted to local weather and soil conditions.

8. a) Crossing and training of the crossprogeny, combined with individual selection is also applied to vegetables, Thus have been created the varieties of pimento: Gras Romînesc 69 and the pimento-tomato variety Colectivist 1962. The first has a very vigorous growth, is sufficently virus resistant and very productive, in good agricultural conditions. The pimento-tomato has big fruits weighing 120 - 150 g, fleshy and sweet, and is very productive and resistant to viroses.

b) The same method has originated the early maturing eggplant variety ICHV 166, very productive, with medium sized fruits (340 g). All these new varieties and lineages of vegetables yield 10 - 30 % more than those grown in the past.

9. a) In the field of corn breeding the method of crossing between various subspecies and varieties was first applied, followed by singling out and multiplying the best yielding families, best adapted to the natural conditions of the regions where they were originated. In some cases it was made use of the singling out of families from the local populations, as well as of inbreeding.

b) Thus, starting from Zea mays v. indurata, the following local varieties were obtained: Hîngănesc, the earliest of all corn varieties, grown in the North of the country; Portocaliu de Tg. Frumos, moderately precocious, with medium sized grains, rich in protein and fat, resistant to drought; Romînesc de Studina, moderately precocious, very productive, resistant to drought, Dobrogean, moderately precocious, productive and resistant to drought, Bănătean, Arieşan and Galben Timpuriu, these last three very productive, with rather late maturation, grown in regions with more frequent rainfalls.

c) By the same method was obtained from Zea mays v. dentiformis the corn variety ICA 54, grown on large acreages. It is a rather late maturing variety, very resistant to drought and shrivelling, very productive in the regions with poor rainfall.

d) The local corn varieties are generally resistant to drought and shrivelling, with grains of a very good quality. Excepting the local variety ICA 54, all the other local corn varieties, because of their small yields, are gradually replaced by double corn hybrids, the yields of which are by 40 - 60 % higher.

e) Nowadays we are applying, in corn breeding, the controlled inbreeding of different native and imported corn varieties and crosses, establishing their general and specific cross ability, so that we may use the best inbred lineages for the creation of our own double crosses between varieties and lineages. At the present stage, the HSL 196 and HSL 213 crosses between varieties and lineages have been originated and grown on large acreages, as well as the HDF 208 double cross. They yield over 5000 kg. of grains per hectare, even in non-irrigated fields, and are more resistant to drought

and shrivelling than the imported corn double-crosses.

10. a) In addition to the varieties and crosses originated by selection in the Rumanian People's Republic, some imported varieties and crosses are cultivated on large acreages. The most important among them are: the winter wheat varieties: Bezostaia 1, Beleterkovskaia 198, Skorospeka 3, Bulgaria 301, Triumph, Ponca, San Pastore and Harrach; the summer wheat varieties: Marquis and Selchirch ; the two-rowed summer barley varieties: Illinetki 5, Proctor and Hanna Kargyn ;the winter rye variety Petkus, the double corn crosses VIR 42, Warwic 303, 260, 277 and 600 and Wiscosin 278 the pea varieties Victoria Strube and Ceres; the soya beans: Reiner, Capital and Amurskaia 41; the fodder soya Lincoln; the fibre flax Concurent. On small areas, we are growing and testing a great number of imported hybrids and varieties.

b) As compared to our former varieties, the above mentioned imported ones yield from 20 to 40 percent more, are resistant to lodging and cryptogamic diseases, but are less adapted to the various climate and soil conditions of our country.

11. In order to increase agricultural production, certain microbiological preparations, are used in the Rumanian People's Republic, among which the most important are: Nitragin, which determines an important increase in leguminous crops, Azotobacterin, with the same effect on winter wheat, sugarbeet and potatoes, Fosforobacterin for all crops, and Lactobacterin to improve the fermentation process of silo forage.

12. In the process of agricultural plant breeding, there has been originated in the Rumanian People's Republic a rich and valuable initial material for selection, which may be of great importance to the further development of plant breeding, consisting of: malesterile corn lineages, inbred corn, rye and sunflower lineages, various hybrid generations of Triticum vulgare, interspecific and intergeneric hybrid populations of the genus Triticum, tetraploidic material for winter rye and sugarbeet, a range of local and imported varieties of winter and summer wheat, winter rye, peas, beans, lentils, oil and fibre flax, hemp, cotton, potatoes, sugarbeet, sorgo, vegetables, fruit trees, grapevines, a.s.o.

13. Used rationally and in the conditions of an advanced agricultural technique, the selected seeds of plants from different varieties and hybrids, well adapted to the weather and soil conditions of the country, contributes to the rise of agricultural production. Thus, in 1962, in various parts of our country, winter wheat yielded from 3.100 to 4.932 kg. grains pro hectare, on acreages of 300 - 3.500 hectares. By applying an advanced agricultural technique we had yields of 2,000 - 4,000 kg/ha. grains of leguminous crops, up to 5,000 kg/ha. corn grains, 50 - 70 tons/ha tomatoes, 30 - 40 tons/ha pimentos, etc. Such yields could not even have been thought of, only twenty years ago. The problem we are now concerned with is how to make the best of the favourable conditions created by the collectivisation of our agriculture, so as to succeed in extending the use of selected seeds to the whole acreage on which crops are grown, and to generalize the above mentioned high yields.

14. Comparative studies of the best plant varieties and hybrids, adoption and generalization in the production process of the most recent achievements reached on a world scale in the field of agricultural plant breeding, are important factors which will contribute considerably to the

rise of agricultural production. The reciprocal exchange of selected seeds, planting material, microbiological preparations and initial breeding material between the different countries is in our opinion the right way to bring an important contribution to the rise of agricultural production in all countries of the world.

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